

CLAIMS

1. A tactile sensor assembly comprising:  
a force transmission member; and  
a sensor;

wherein the force transmission member includes a plurality of projections for transmitting an applied force to the sensor, and wherein the sensor is adapted to detect said applied force and to output a signal indicative thereof.

2. An assembly as claimed in claim 1, wherein the force transmission member is adapted to transmit forces applied on an object to the sensor.

3. An assembly as claimed in either of claims 1 or 2, wherein the assembly is adapted for use in surgical procedures.

4. An assembly as claimed in claim 3, wherein the assembly is adapted for use in minimal access surgery (MAS) procedures.

5. An assembly as claimed in any preceding claim, wherein the projections are tapered.

6. An assembly as claimed in claim 5, wherein the projections are conical.

7. An assembly as claimed in any one of claims 1 to 4, wherein the projections are substantially uniform in cross-section.

8. An assembly as claimed in claim 7, wherein the projections are cylindrical.

5 9. An assembly as claimed in any preceding claim, wherein the sensor is adapted to output an electrical signal.

10 10. An assembly as claimed in any preceding claim, wherein the sensor is adapted to measure at least one of compression and deflection of the projections.

15 11. An assembly as claimed in any preceding claim, wherein the sensor is a capacitive sensor adapted to measure a capacitance value between the projections and the sensor.

20 12. An assembly as claimed in any preceding claim, wherein the sensor is adapted to output data indicative of a degree of deformation of at least one of the projections, to facilitate generation of an image of said at least one deformed projection.

25 13. An assembly as claimed in any one of claims 1 to 11, wherein the sensor is adapted to output data indicative of a force between the object and the sensor.

30 14. An assembly as claimed in claim 13, wherein the sensor is adapted to generate voltage data corresponding to the capacitance between the projections and the sensor, and to output data indicative of a corresponding force.

15. An assembly as claimed in claim 13, wherein the sensor is adapted to generate voltage data corresponding

to the capacitance between the projections and the sensor, and to output voltage data for subsequent conversion by a processor into data indicating the force exerted on the sensor through the projections.

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16. An assembly as claimed in any preceding claim, comprising a processor for receiving data from the sensor.

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17. An assembly as claimed in claim 16, when dependent on claim 12, wherein the processor is adapted to determine a distribution of force between the projections and the sensor.

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18. An assembly as claimed in claim 16, when dependent upon claim 13, wherein the processor is adapted to process the data and to generate an output indicative of a distribution of force between the projections and the object.

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19. An assembly as claimed in any one of claims 16 to 18, wherein the processor includes software adapted to measure deformation of the projections relative to a starting configuration, to determine the force exerted between the object and the sensor.

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20. An assembly as claimed in any preceding claim, comprising a display coupled to the sensor, for displaying an image of the projections.

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21. An assembly as claimed in claim 20, wherein the display is directly coupled to the sensor by a data link cable.

22. An assembly as claimed in claim 20, including a transmitter and receiver for transmitting data between the display and the sensor, such that the display is indirectly coupled to the sensor.

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23. An assembly as claimed in any preceding claim, wherein the force transmission member includes at least 100 projections per square centimetre.

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24. An assembly as claimed in any preceding claim, wherein the force transmission member is of an elastically deformable material.

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25. A palpation assembly comprising:  
a tactile sensor assembly including a force transmission member and a sensor, wherein the force transmission member includes a plurality of projections for transmitting an applied force to the sensor, and wherein the sensor is adapted to detect said applied force and to output a signal indicative thereof; and  
at least one palpation member for palpating the object.

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26. A palpation assembly as claimed in claim 25, wherein the palpation assembly is adapted to palpate the object between the palpation member and the force transmission member.

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27. A palpation assembly as claimed in either of claims 25 or 26, wherein the palpation member comprises an arm adapted to exert a force on the object to palpate the object.

28. A palpation assembly as claimed in any one of claims 25 to 27, wherein the palpation member is moveably mounted relative to the force transmission member and adapted for movement both towards and away from the sensor and in a lateral plane relative to the sensor.

29. A palpation assembly as claimed in any one of claims 25 to 28, wherein the palpation member and the force transmission member are independently moveable relative to each other.

30. A palpation assembly as claimed in any one of claims 25 to 29, wherein the tactile sensor assembly is a tactile sensor assembly as claimed in any one of claims 2 to 24.

31. A tactile probe comprising:  
a tactile sensor assembly adapted for movement with respect to an object, the tactile sensor assembly including a force transmission member and a sensor, wherein the force transmission member includes a plurality of projections for transmitting an applied force to the sensor, and wherein the sensor is adapted to detect said applied force and to output a signal indicative thereof.

32. A tactile probe as claimed in claim 31, wherein the tactile sensor assembly is a tactile sensor assembly as claimed in any one of claims 2 to 24.

33. A method of detecting tactile properties of an object, the method comprising the steps of:

providing a tactile sensor assembly comprising a force transmission member and a sensor, the force

transmission member having a plurality of projections for transmitting an applied force to the sensor;

locating the force transmission member in contact with the object;

5 moving at least one of the object and the force transmission member relative to the other to compress at least one of the projections, to transmit a force to the sensor; and

10 outputting a signal from the sensor indicative of the applied force.

34. A method as claimed in claim 33, comprising measuring deformation of the projections to determine tactile properties of the object.

15 35. A method as claimed in either of claims 33 or 34, comprising measuring deflection of the projections.

20 36. A method as claimed in any one of claims 33 to 35, comprising palpating the object to exert a force on the sensor.

25 37. A method as claimed in any one of claims 33 to 35, comprising bringing the force transmission member into contact with the object and moving the force transmission member relative to the object to transmit a force to the sensor.

30 38. A method as claimed in any one of claims 35 to 39, comprising displaying an image of the projections.

39. A method of palpating an object, the method comprising the steps of:

providing a tactile sensor assembly comprising a force transmission member and a sensor, the force transmission member having a plurality of projections for transmitting an applied force to the sensor;

5        locating the force transmission member in contact with the object;

      palpating the object to compress at least one of the projections, to transmit a force to the sensor; and

10       outputting a signal from the sensor indicative of the applied force.